

Spanish onshore sampling of *Lepidorhombus spp.*

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ABSTRACT

Results of *Lepidorhombus spp.* from the Spanish onshore sampling programme under the Data Collection Framework (2009-2014) are presented. Sampling covers two species (*Lepidorhombus whiffiagonis* and *Lepidorhombus boscii*) in ICES Subarea VI, VII, Divisions VIIIab and Divisions VIIIc-IXa. Fishery description shows the importance of five métiers for these species and the relevance of a small group of ports. A description of the sampling level, sampling design and sampling procedures in relation to landing practices are presented, as well as a brief discussion about further developments to improve the sampling.

Keywords: Onshore sampling, Megrim.

The Spanish fishery of megrims

The genus *Lepidorhombus* in eastern Atlantic is comprised of two species: megrim (*Lepidorhombus whiffiagonis*) and four spotted megrim (*Lepidorhombus boscii*). These species replace each other within their area of distribution from Iceland to the Mediterranean, with *L. whiffiagonis* being more relevant towards the North.

Because these species are very similar in appearance –main visual difference is found in the 2 distinct spots on both dorsal and anal fins of the four spotted megrim— the two megrim species are not separated in the landings. Both species are assessed separately by the Working Group for the Bay of Biscay and the Iberian waters Ecoregion (WGBIE) but the advice for the two stocks is linked.

Most of the landings are made in Division VIIj (Figure 1) followed by VIIIc. Spanish fleets catch mainly *L. whiffiagonis* in Divisions VIIb-k and VIIIab and both species in Divisions VIIIc and IXa. The distribution of catches by statistical rectangle is presented in Figure 3.

- **Western stock of megrim (mgw-78)**

The western stock of megrim (mgw-78) extends from the Celtic Sea (Subarea VII) to Bay of Biscay (Divisions VIIIabd), being more abundant in the first area. Presence from *L. boscii* is very low in these areas.

The Spanish fishery operating in Subarea VII and Divisions VIIIabd is compounded of trawlers, gill netters and longliners; however the bottom otter fleet targeting demersal fish present the highest amount of megrim catches (Figure 2). This Spanish OTB fleet is currently split into three DCF métiers (Castro *et al.*, 2012), which can be ordered as follows in decreasing megrim landings:

- OTB_DEF_70-99_0_0: Bottom otter trawl targeting megrim and anglerfish in Subarea VII.
- OTB_DEF_>=70_0_0: Bottom otter trawl targeting anglerfish, megrim and other demersal fish in Divisions VIIIabd.
- OTB_DEF_100-119_0_0: Bottom otter trawl targeting hake in Subarea VII.

It is important to note that the effort of the Spanish fleet in non-Iberian European Atlantic waters has suffered a reduction through the last four years: around 80% in métiers OTB_DEF_100-119_0_0, and closed to 25% in métiers OTB_DEF_70-99_0_0 and OTB_DEF_>=70_0_0. Even in this scenario, in 2014 these métiers provided the 90% of the landings from these divisions.

- **Southern megrims (mgw-8c9a and mgb-8c9a)**

Include both megrim species in Divisions VIIIc and IXa: a) *L. whiffiagonis* in both ICES Divisions (mgw-8c9a), with its highest abundance is in Division VIIIc. b) Four-spot megrim, also distributed in both ICES Divisions (*mgb-8c9a*) is more southerly present than megrim.

Southern megrims are caught in mixed fisheries targeting demersal fish including hake, anglerfish and *Nephrops*. Despite the big number of métiers operating in this area, the majority of the catches for megrims are taken by bottom trawlers (Figure 2). These métiers accumulated more than 90% of landings from these divisions in 2014.

- OTB_DEF_=>55_0_0_0: Bottom otter trawl targeting demersal fishes (hake, megrim, anglerfish, horse mackerel and other species) in Division VIIIc and North of the IXa.
- OTB_MPD_>=55_0_0: Bottom otter trawl targeting pelagic fishes (mainly mackerel and horse mackerel) in Divisions VIIIc and northern component of the IXa.

The Spanish sampling program

The ICES Spanish onshore sampling program of the Spanish fleets operating in European Atlantic waters covers both Atlantic National fishing grounds (Division VIIIc and IXa), as well as the non-Iberian European waters (Division VI, VII and VIIIabde) where a number of the Spanish vessels are allowed to fish.

Two institutes, IEO and AZTI, are in charge of carrying the Spanish onshore sampling programme. AZTI covers the landings performed in Basque ports and IEO the landings in the rest of Spanish ports.

- IEO onshore sampling programme has different sampling schemes for selected métiers. Within every sampling scheme the frame is constructed with a list of ports where days and finally trips are selected (Table 1). The sampling frame is stratified by quarter with a systematic monthly allocation of effort. Sampling is done concurrently therefore megrims are not targeted as are sampled as long they appear in the landings of the selected trips.
- AZTI's onshore sampling program has traditionally targeted the main métiers following the DCF guidelines. Ports and days were selected with a view to get a representative sample of the activity of the fleet and to minimize biases related to the selection of the vessels. In 2015, the sampling moved towards a more probability based sampling design, with three different sampling schemes for trawlers, purseiners and artisanal fleet. Main métiers targeting megrims fall in the "trawlers sampling scheme", in which just one port is sampled, representing almost the 90% of the landings. The selection of the day is fixed on Mondays and random one Thursday a month. The selection of the vessel is random and non-response is recorded (Table 1).

Both institutions follow a concurrent sampling strategy, which means that all species landed in a trip are sampled. As a result, the number of trips sampled with megrims differ between years and the evolution of the sampling of megrims is better understood focusing on the five main métiers landing megrims which have been described above (OTB_DEF_70-99_0_0, OTB_DEF_>=70_0_0, OTB_DEF_100-119_0_0, OTB_DEF_>=55_0_0 and OTB_MPD_>=55_0_0). Total number of trips sampled with presence of megrims in the period 2009-2014 is presented in table 2. Selected métiers account for the 92% of the trips sampled and the 97% of the landings in 2014.

The average of annual trips sampled is 26 for métier OTB_DEF_70-99_0_0 and 51 trips for métier OTB_DEF_100-119_0_0 in Subarea VI-VII; 144 trips for OTB_DEF_>=55_0_0 and 26 for OTB_MPD_>=55_0_0 in VIIIc-IXa; and 49 trips for OTB_DEF_>=70_0_0 in VIIIabde.

The proportion of both species in the samples by area and year (Fig. 5) and DCF métier (Fig. 6) match the known distribution pattern with four spotted megrim being replaced by *L. whiffiagonis* towards the Northeastern waters. In Division VIIk (Southern area of Porcupine Bank) the main Spanish fishery corresponds to OTB_DEF_100-119_0_0, a metier targeting hake which in fact lands a small fraction of megrims.

Sampling in relation to landings practices

Megrim are landed along more than 60 ports. 10 of them (Figure 4) received 90% of the landings in 2014 –including 2 foreign ports: Castletown and Brest—. Sampling programme covers the 8 Spanish locations (Table 3). Megrim are sold in the respective auctions where

sampling takes place commonly as fish is more accessible; in the Basque Country sampling of trawl fisheries is made at dawn, just before the fish is sold in private auctions. Fish is sorted into commercial size categories which are not homogeneous between ports and even nor between days. There are normally a high number of commercial categories established for megrims—up to 11—. As all size categories available at market are sampled, this practice of the auctions –and landing both species together—has a direct effect on the sampling, increasing the number of individuals sampled (Fig. 7) compared to other commercial species. In the auction fish are normally laid out in boxes on the floor of the auction. Boxes are weighted and labelled with the corresponding vessel identification, commercial size category and weight.

Estimation and quality control procedures

Lengths by sampled trip are raised first to the trip and then to the total activity of the métier. At IEO, the raising was done to the métier total landings until 2011, when an improvement in the availability of official statistics made more feasible to use the total effort of the métier (total number of trips) in the raising procedure. At AZTI, the raising is done to the total landings made in each combination of métier and quarter. Since the DCF implementation, the raising procedure is done disaggregated by quarter, and also provided to InterCatch by ICES Division. However, the respective length frequency distribution is allocated to the respective effort level developed in each Division.

Quality assurance and quality control of data, once collected, is done at different stages. Data entered to the databases are verified through different checks in order to avoid errors. Finally data is validated for estimation process. IEO started in 2014 to carry out qualitative analyses using COST tools (Anon., 2009). This software allowed the detection of outliers in length frequencies in the most disaggregated level through the *Delta* measure (Vigneau and Mahevas, 2007) and the estimation of precision estimates for length structures according to the DCF.

Improvements in the Spanish onshore sampling programme

Both major ports and major métiers are currently sampled as part of overall sampling programme and no bias seems to be associated to this coverage for the megrims.

In the regional context there is a general recommendation to move towards a probabilistic sampling scheme. For the IEO a better understanding of the implications of this is currently needed but different steps – e.g. sampling schemes designed for groups of métiers, evaluation of the random selection of PSUs or amelioration of the random selection of SSUs – are envisaged for future developments. At AZTI, the sampling has been redesigned in 2015, in order to fulfil the guidelines for a probability based sampling design. However, the results of the 2015 experience need to be analysed for future improvements.

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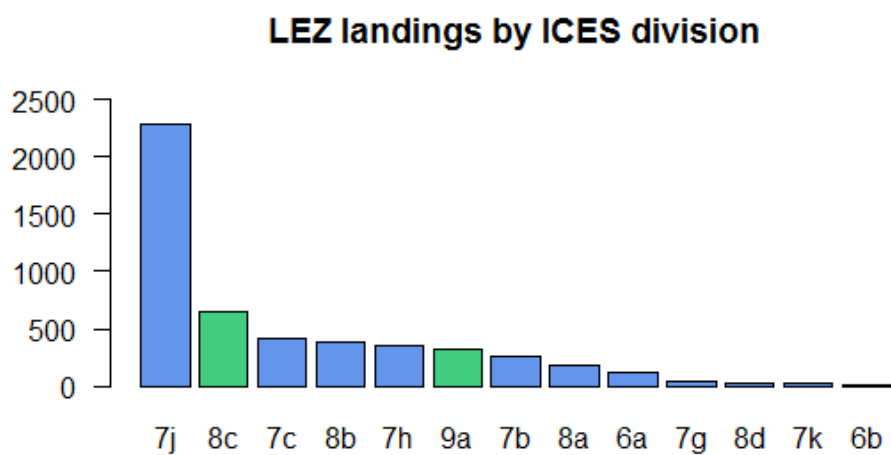


Figure 1. Spanish landings (tonnes) of megrims by ICES Division for 2014. (blue: Western stocks; green: Southern stocks)

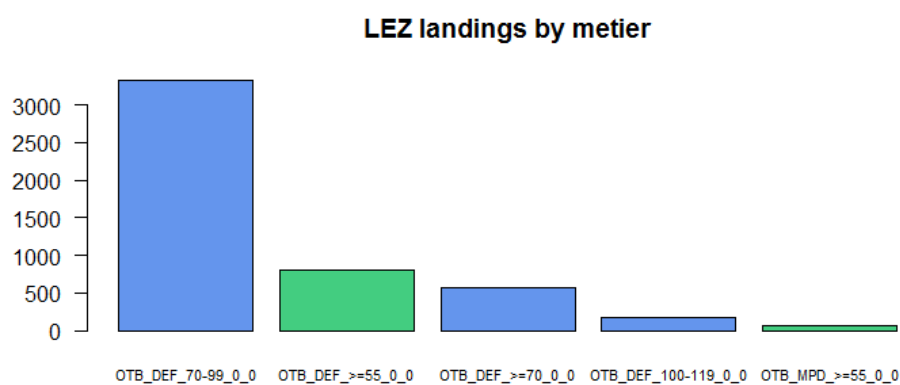


Figure 2. Spanish landings (tonnes) of megrims by métier for 2014. (blue: Western stocks; green: Southern stocks)

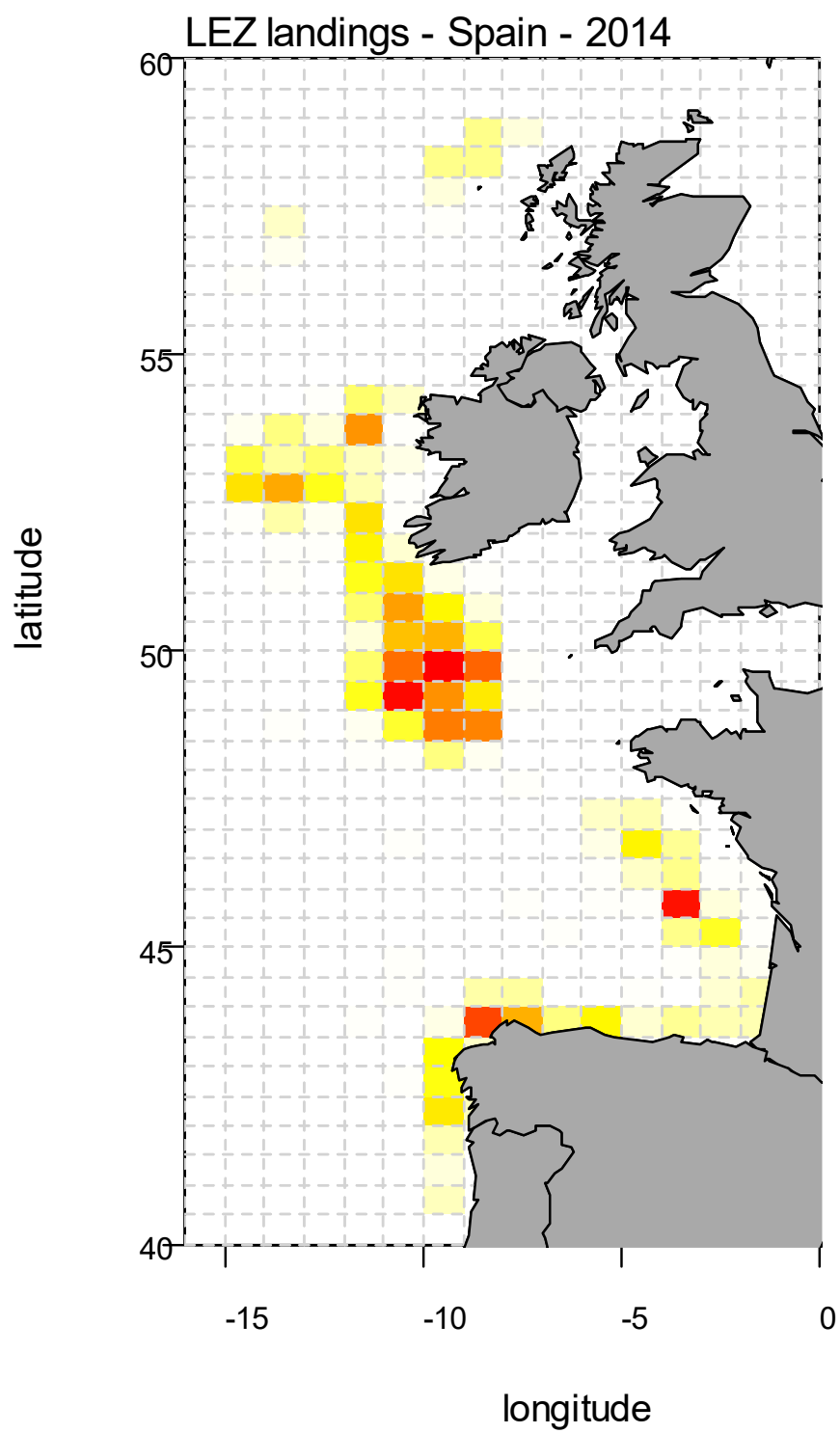


Figure 3. Spanish landings (t) of megrims by statistical rectangle for 2014.

Table 1. Sampling scheme covering megrims for IEO and AZTI.

Sampling institution	IEO	AZTI
Sampling scheme	Métier	-
Frame	Ports	Trawlers (3 lists)

1st SU	Days	Day*Port
Stratification 1st SU	Quarter	Month
Selection 1st SU	Varies between ports: Quasi random, systematic and opportunistic	Oportunistic (coordinated among fleets)
2nd SU	Trips	Vessel sale event
Stratification 2nd SU	-	-
Selection 2nd SU	Quasi random	Random
3rd SU	Box	Box
Stratification 3rd SU	Commercial size category	Commercial species & Commercial size category
Selection 3rd SU	Opportunistic	First box in the tower

Table 2. Onshore sampling level by métier 2009-2014 (number of trips with megrims sampled).

Area	Métier	Year					
		2009	2010	2011	2012	2013	2014
Subarea VII-VI	OTB_DEF_70-99_0_0	22	19	24	24	23	43
	OTB_DEF_100-119_0_0	53	54	65	62	36	38
	OTHERS	7	4	5	2	6	1
Divisions VIIIab	OTB_DEF_>=70_0_0	54	45	53	45	49	45
	OTHERS	7	14	25	28	3	4
Divisions VIIIc-Xa	OTB_DEF_>=55_0_0	140	120	137	144	142	180
	OTB_MPD_>=55_0_0	0	21	49	50	30	8
	OTHERS	5	6	3	4	12	4

Table 3. Onshore sampling level by port 2009-2014 (number of trips with megrims sampled).

Port	Year					
	2009	2010	2011	2012	2013	2014
A Coruña	99	87	125	119	89	116
Avilés/Gijón	17	21	24	27	27	24
Marín	20	18	20	20	22	24
Ondarroa	23	29	24	24	24	23
Ribeira	19	27	35	34	34	23
Santander	54	54	71	68	58	64
Vigo	43	38	51	51	43	46
Others	13	9	11	16	4	3

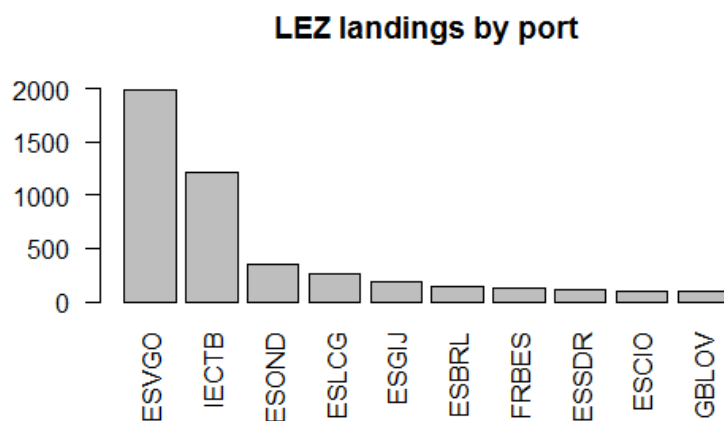


Figure 4. Spanish landings (t) of megrims by port for 2014 (90% of landings)

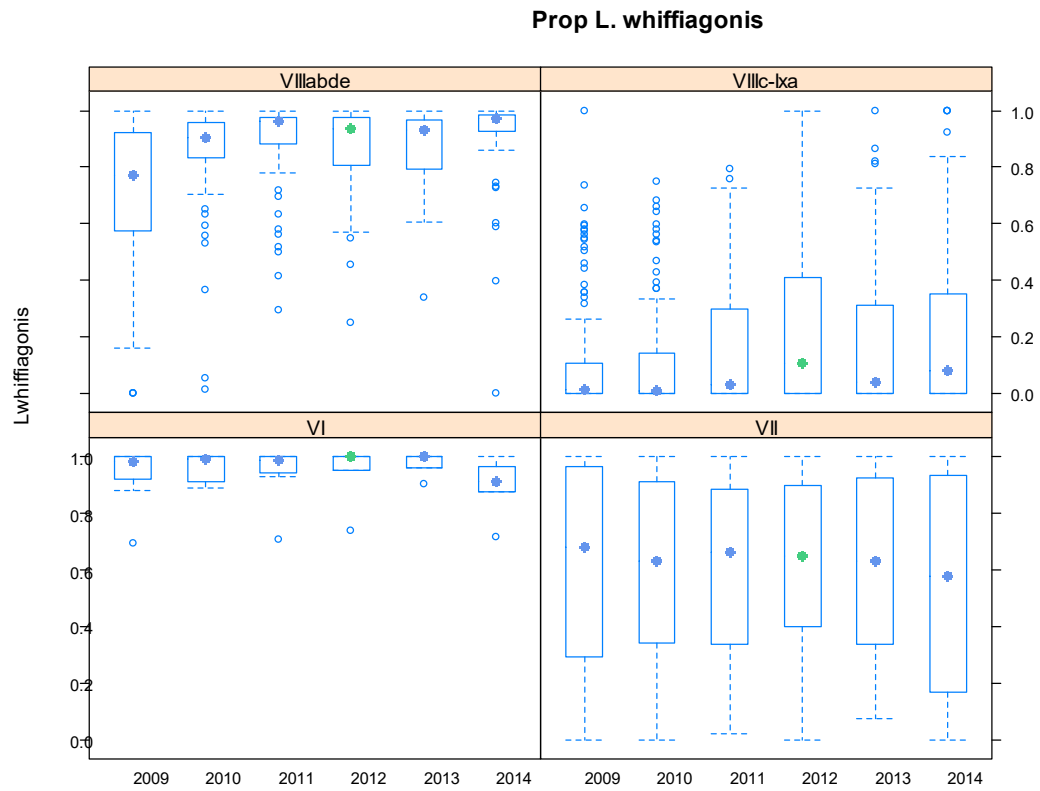


Figure 5. Proportion of individuals sampled for both species, 2009 - 2014 (blue: Western stocks; green: Southern stocks)

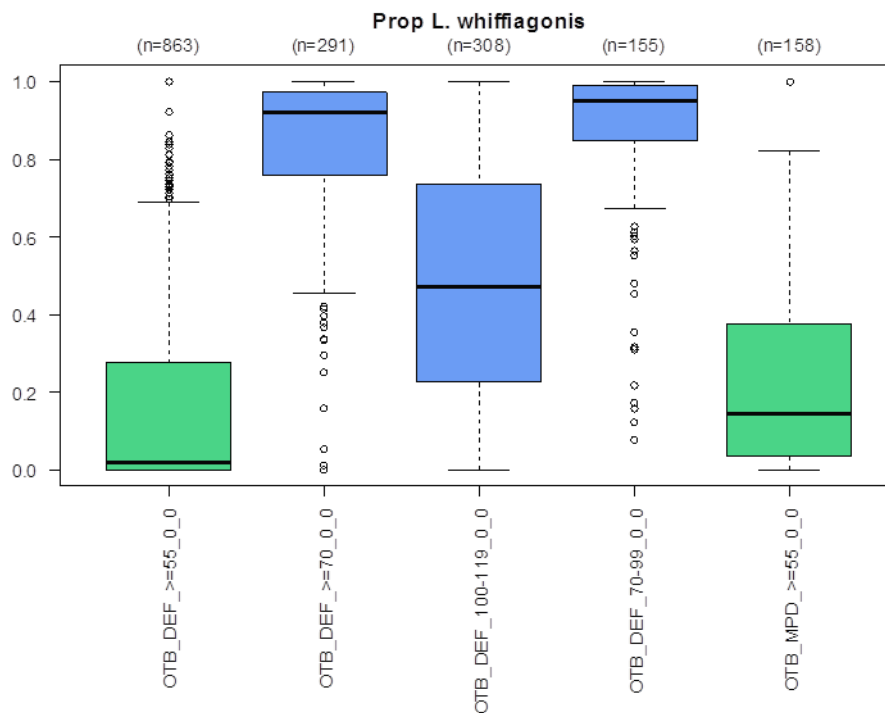


Figure 6. Proportion of individuals sampled for both species, 2009 - 2014 (blue: Western stocks; green: Southern stocks)

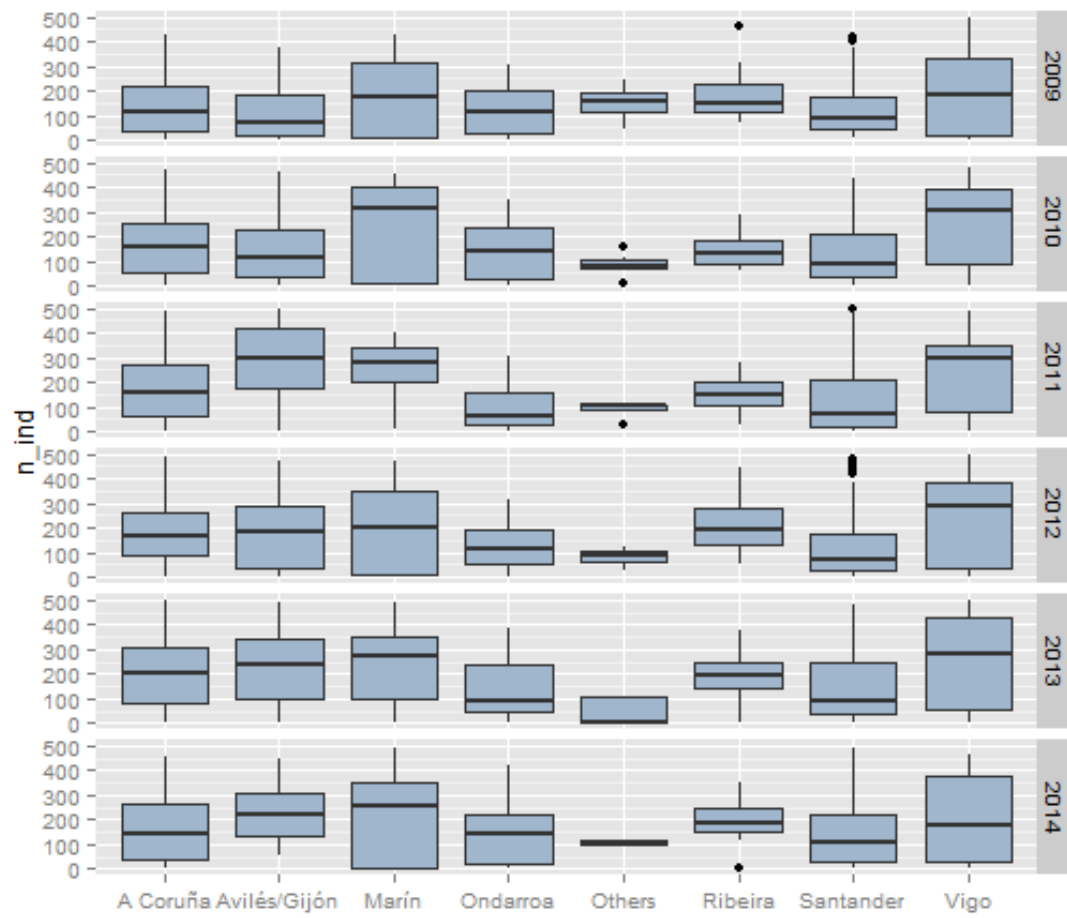


Figure 7. Number of individuals sampled per trip.